



Color Dynamics

**THE SCIENTIFIC UTILIZATION OF THE ENERGY IN COLOR
TO PROMOTE EFFICIENCY IN INDUSTRY**

TREMENDOUS TRIFLES



INDUSTRY has spent millions of dollars on time-and-motion studies to minimize body fatigue. But up to now except in the field of improved illumination—practically nothing has been spent to save workers from eye fatigue.

Frequently the changes recommended as a result of a time-and-motion study seem trifling. The stool that a worker sits on goes up an inch or two higher. The handle of a shovel is made slightly shorter. The grip on a wrench is changed. And the productivity of the man who uses that stool, shovel, or tool is increased by ten or fifteen percent.

The history of modern industry abounds in examples of *trifles* that have turned out to be of *tremendous* importance.

The new science of Color Dynamics deals with one of these "tremendous trifles"—COLOR! At first thought, it may be hard to believe that the color on a machine, on a wall or on a traffic lane could have a marked influence on a worker's morale or his rate of production. But remember—the executives of days gone by must have been equally doubtful about the practical value of adding to, or subtracting an inch or two from a factory stool.

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Objectives of COLOR DYNAMICS

1. *To Promote*
CONTINUITY OF EMPLOYMENT
2. *To Improve*
EFFICIENCY OF OPERATION
3. *To Maintain*
QUALITY OF PRODUCTION

Every production manager wants his workers to stay on the job — to process the maximum quantity of material — and to have the quality of that work measure up to the highest standards.

As the following pages will show, Color Dynamics can make a real contribution towards the attaining of these three objectives. Color Dynamics means more and better work per man-hour — *and more man-hours per man.*

LESS ABSENTEEISM



The morale and efficiency of industrial workers are drastically affected by certain physical conditions under which they work. Continued eyestrain leads to nervous tension — causes unnecessary fatigue. Drab, cheerless surroundings encourage mental depression — make the job seem harder. The Color Dynamics System eliminates these negative factors. It also reduces the even more insidious "absenteeism on the job" in which a worker is

FEWER INJURIES



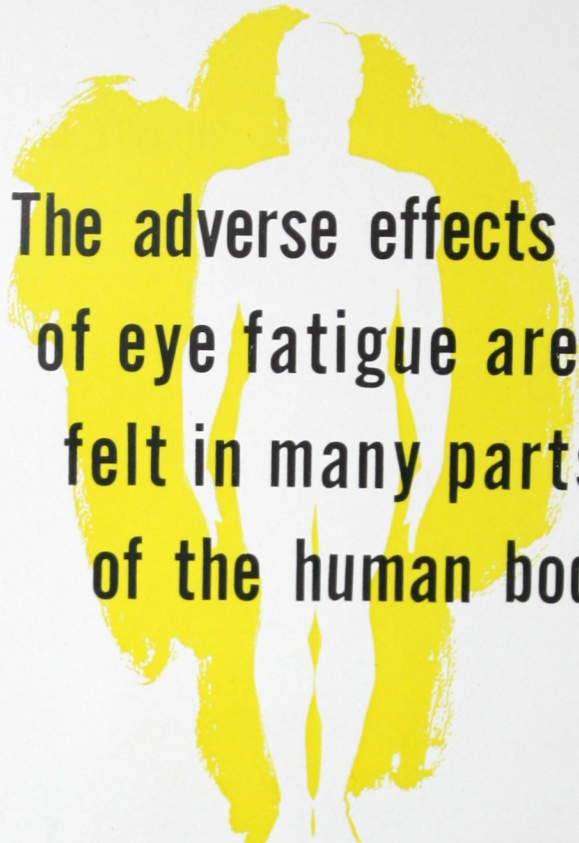
continually finding reasons to leave his machine. • Color Dynamics is concerned not only with the factory background of walls, floor and ceiling but also with the machines. Methods for painting machinery have been developed which reduce the danger of personal injury. At the same time, since eyestrain and the resulting fatigue are minimized, the workers themselves remain more alert and are better able to avoid hazards.

LABOR BENEFITS



• Management and labor can see eye to eye on the subject of Color Dynamics. From the point of the employee, the purpose of Color Dynamics is to make his working day easier — to keep him happier on his job — and to contribute to his safety — to guard his health by eliminating insidious "eye fatigue" frequently the cause of nervous tension.

COLOR DYNAMICS



**The adverse effects
of eye fatigue are
felt in many parts
of the human body**

THE MUSCLES OF THE EYE

The movements of the eyeball are operated by seven muscles. Every time the eye moves from side to side or up and down, muscular action takes place. When the iris contracts or expands, that also requires effort by the sphincter muscle.

Eye muscles get tired — just like any other set of muscles.

Yet, curiously enough, this tiredness is not commonly felt in the eye itself. Eye

fatigue communicates itself to other parts of the body. A worker suffering from eye fatigue feels tired "all over." He may become the victim of headaches, "nerves," digestive upsets and many other disturbances.

Eye fatigue and its various by-products slow a worker down. Both the quantity and the quality of his production falls off. Absenteeism and injuries go up.

Decreases Eye Fatigue

CAUSES OF EYE FATIGUE IN WORKERS

TENSION . . .

Hold out your arm, and at the same time, tense the muscles of your fingers and forearm. Notice how quickly your arm grows weary. The same thing happens to a worker's eyes when the color of the material he is fabricating is too similar to the color of his machine. The extra effort required to differentiate between the material and the machine is a potent source of eye strain.



CONSTANT ADJUSTING . . .

Go from a sunlit street into a dark moving picture theatre. For a minute or two, you are so blind that you cannot find a seat. A worker who glances up from a light colored machine to a dark wall (or vice versa) has the same experience to a lesser degree.

"Yet steady fixation upon a given task is fatiguing. Eyes are more comfortable when their direction of gaze changes frequently. Hence it is both natural and restful to glance up from work being done from time to time. If surroundings are dark, the effect of such glances will be to require the readjustment of the eyes for a different light intensity, and a second readjustment when the eyes again return to work. This requires time and a loss of efficiency results."*

In Color Dynamics, important machine sections are painted in different, but not too widely contrasting colors, guiding the workers' eyes to the specific points requiring attention, and thus avoiding needless travel. The walls are painted in "eye-rest" colors, which do not force the worker to make fatiguing adjustments.



*Authority—The Distinguished Service Foundation of Optometry.

COLOR DYNAMICS

Applied to ...



Open here



1. MACHINES

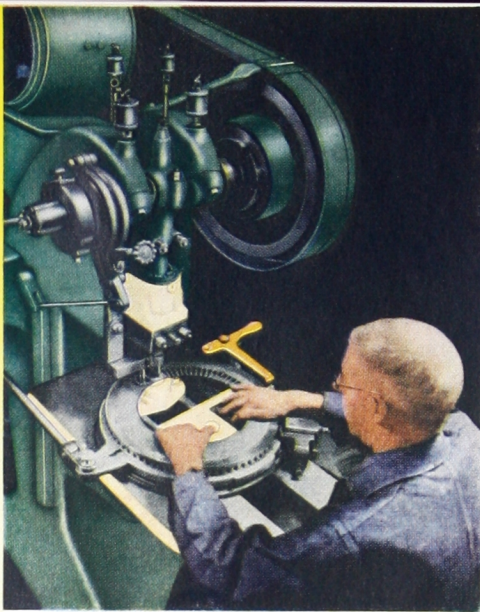
2. WALLS AND CEILINGS

3. FLOORS AND AISLES



Open here

On the inside pages, three major steps in the application of the principles of Color Dynamics to a typical factory are illustrated. Each step will be discussed in detail farther on in this book.



COLOR DYNAMICS

The first job of Color Dynamics is to separate the critical from the non-critical parts of the machine.

FOCAL COLORS

The critical or operating parts of the machine should be given a color that comes quickly to the eye, a color that "pops up," in strong contrast to the stationary or non-critical parts of the machine. This is known as a *Focal Color*. It focuses the worker's attention exactly where it should be — arrests his eye and reduces the unnecessary travel which is bound to occur when the whole machine is a monotone in "machine gray." As has been pointed out before, unnecessary eye travel throughout the working day is a common cause of eye fatigue.



RECEDING COLORS

While the critical part of the machine must *come forward* the non-critical parts must *drop back*. The widely used "machine gray" does this to a certain extent but is in itself a somewhat depressing, morale-lowering color. After careful study, the Pittsburgh laboratories have developed a receding color called *Vista Green* for the body of the machine. No other color has such a relaxing effect on the human eye as green — yet it does not act as a depressant. The widespread use of green by Nature in forest and field is the perfect proof of this point.



Applied to Machines

Vista Green is recommended for the body of most machines. Occasional exceptions occur to this rule. In plants engaged in food preparation it may be advisable to use white to give a more sanitary appearance.

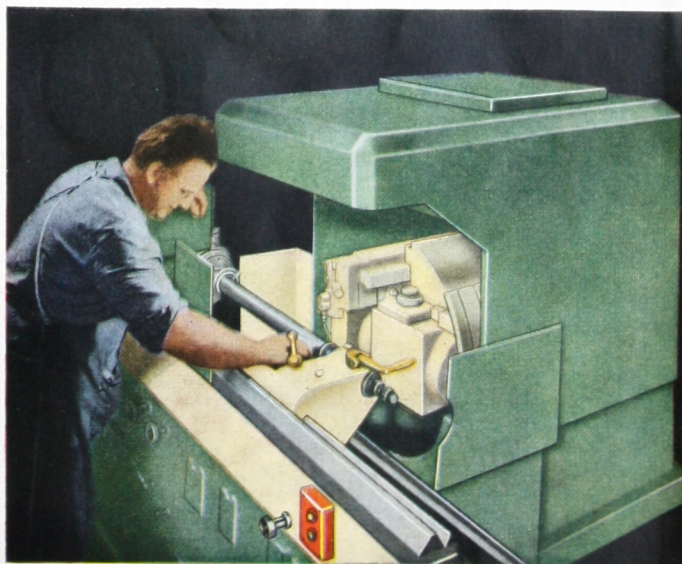
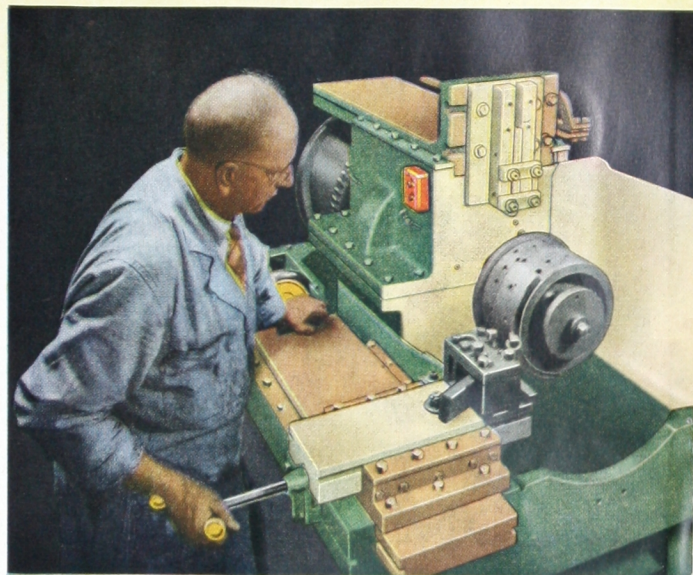
DOUBLE CONTRAST NECESSARY

In selecting the focal color, it is important not only to choose one that is in sharp contrast to the non-critical parts of the machine but also one that affords a clear-cut contrast with the material being fabricated. For instance, a focal color of light gray is completely wrong if the material is aluminum or stainless steel. The worker is constantly straining to see where the material ends and the machine begins. There is no easy-to-see line of division.

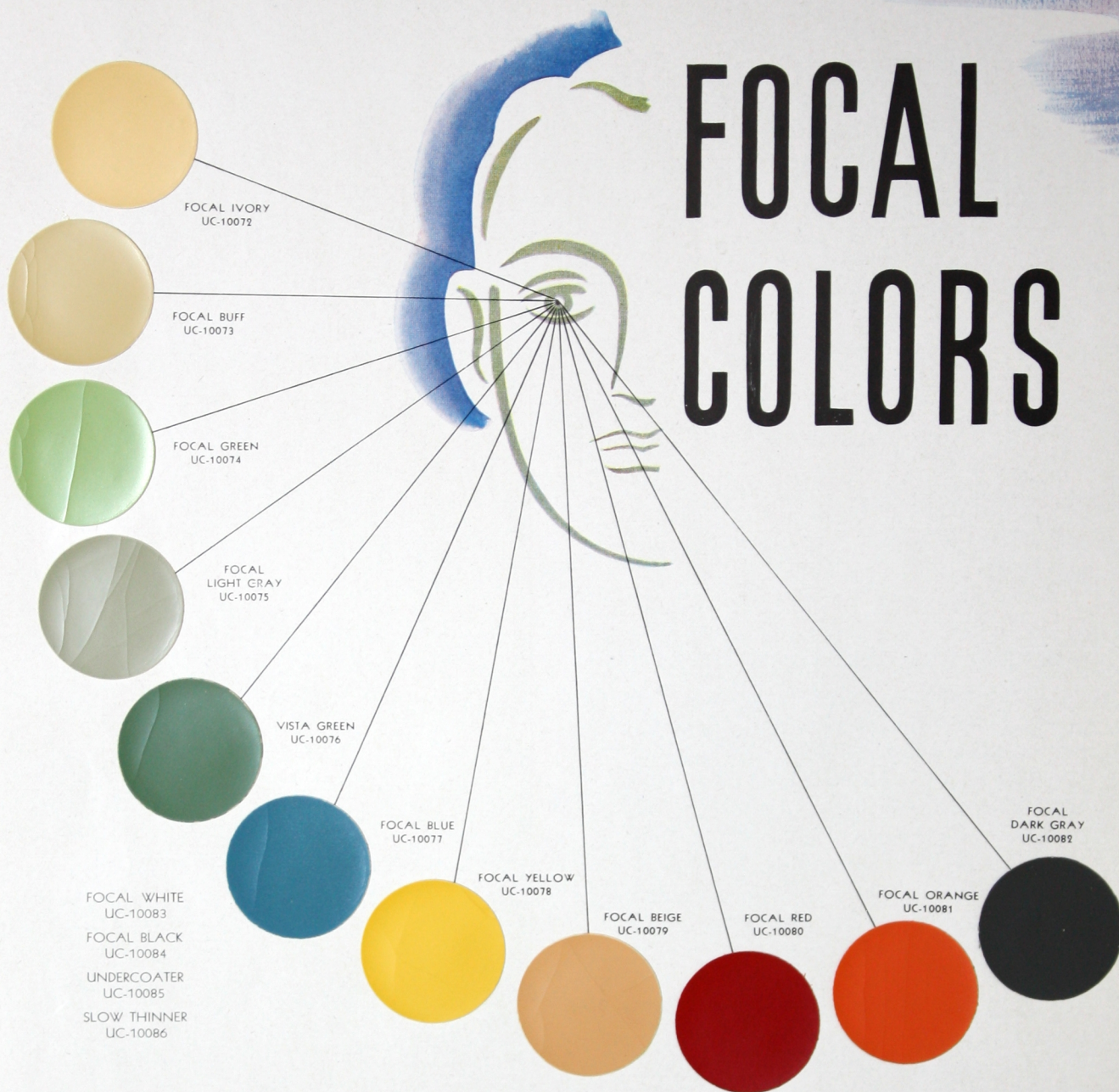
The ideal situation is one where the focal color provides a satisfactory contrast with *both* the stationary part of the machine and the material flowing through it.

When this *double contrast* is achieved, eye travel is discouraged and tension is reduced. The result of this improved visibility soon makes itself felt in the daily output of the worker — and in his attitude towards his work.

In essence, Color Dynamics is based on principles directly opposed to camouflage practices. To camouflage an object color is used to hide and obscure. In Color Dynamics, color is used to highlight, reveal, and emphasize.



FOCAL COLORS



WITH the wide variety of materials being fabricated in various industries, one or two focal colors would not be sufficient to meet every situation. For this reason, Pittsburgh has developed the ten focal colors illustrated above.

Note that while these focal colors come forward, they do not "hit you in the eye." They dry to an eggshell sheen which diffuses light and eliminates objectionable glare. This is important, since glossy colors which cause

light to bounce back would lead to eyestrain.

Pittsburgh Lavax Machinery Enamel, in which Vista Green and these ten focal colors are available, is designed to produce a most practical, quick drying, durable finish for use on machinery and other factory equipment. It is tough and resistant to softening from oil or grease. It has exceptional adhesion and will withstand expansion and contraction often caused by the changes in temperature common to such equipment.



WRONG Gray used on machine brings about a neutral monotone. There is no distinction between critical and non-critical parts of machine. Gray material being processed causes it to blend with background.



BETTER Through the use of Vista Green the non-critical parts of machine have been made to recede, but incorrect focal color fails to afford proper contrast between machine and materials being processed.



RIGHT Here the right focal color (and it may be one of many) results in proper contrast between machine and material being processed, emphasizes the critical parts while Vista Green causes the non-critical parts to recede.

the Pittsburgh FOCAL COLOR SELECTOR

Every Pittsburgh representative is equipped with this Selector. It simplifies the problem of selecting the right focal color for any given machine.

Vista Green is the color generally recommended for the non-critical parts of the machine.

Selection of the proper focal color is made by placing the various focal color panels back of the Vista Green

so that focal colors are visible through the opening in the Vista Green panel.

A small piece of the material being fabricated should then be placed across the opening in the Vista Green panel. The focal color giving the right double contrast with the color of the material and the body color of the machine is the proper focal color to use.

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COLOR DYNAMICS

Applied to WALLS and CEILINGS

COLOR not only has a physiological effect on the worker's eyes and body — it also has a psychological effect on his mind. One color can give a man a feeling of "lift." Another can send him into the blues. Still another has a "disturbing" effect.

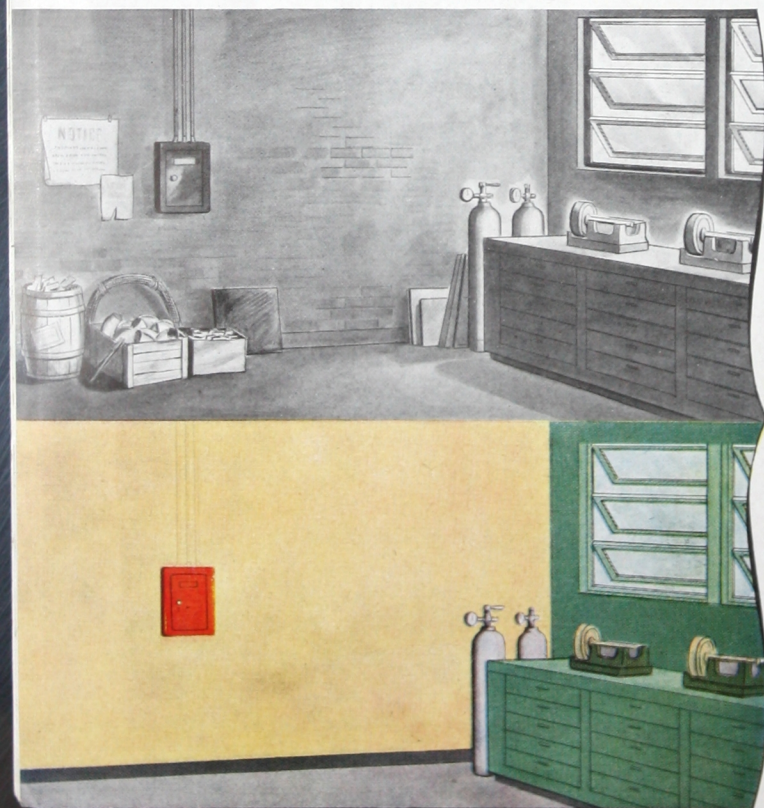
Cheerfulness plus restfulness — plus good visibility — is the fundamental aim of Color Dynamics. On this and the following pages, a few of the broad considerations that guide our representative when he prescribes colors for walls and ceilings are touched on briefly.

1—MORALE-BUILDING SURFACES

ALL other things being equal, almost everyone feels a bit more light-hearted on a sunny day than when the skies are overcast. Yet many factories use colors on walls and ceiling which give the impression of a perpetual cloudy day.

Cheering up such an interior is extremely simple for a Pittsburgh representative. He recommends colors that suggest sunlight.

In factories where the temperatures must necessarily be high, Color Dynamics calls for cool colors to act as mental and emotional stabilizers. On the other hand, warm shades are advisable where low temperatures must be maintained.



2—EYE-REST SURFACES

Certain walls stand directly in front of machines. They are constantly in the worker's field of vision and are glanced at frequently in the course of the day.

If the machine is dark and the wall light — or vice versa — the eye has to make a quick adjustment. The energy required to make this adjustment a few times is slight but multiply it by several hundred during the course of the day and you have a very common source of eye-strain. For this reason, eye-rest surfaces should have approximately the same general *tone* of color (though not necessarily the same color) as the one the worker sees when he is concentrating on his work.

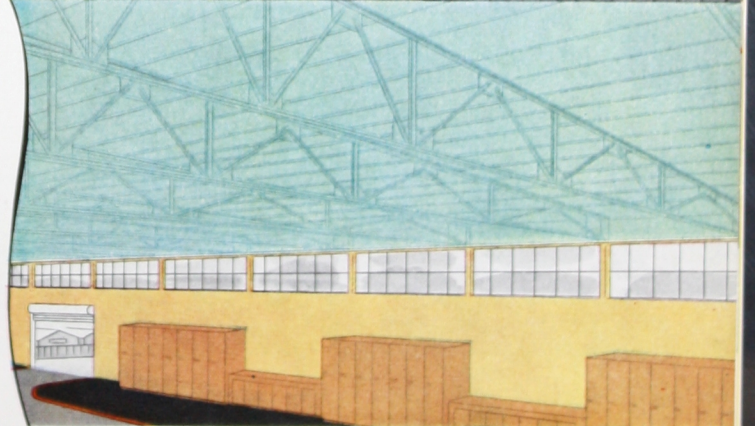
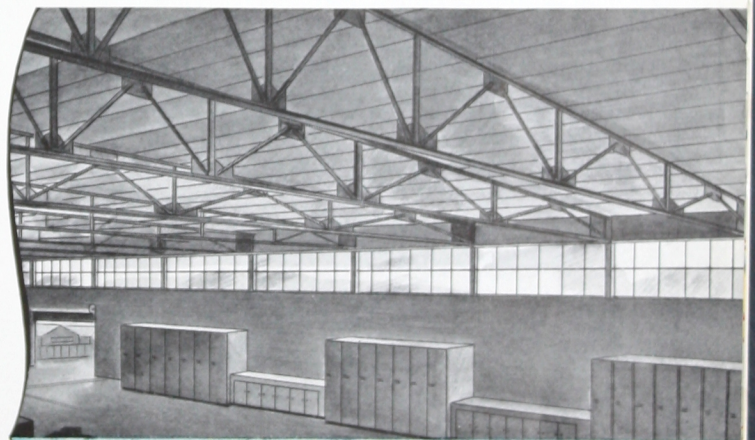
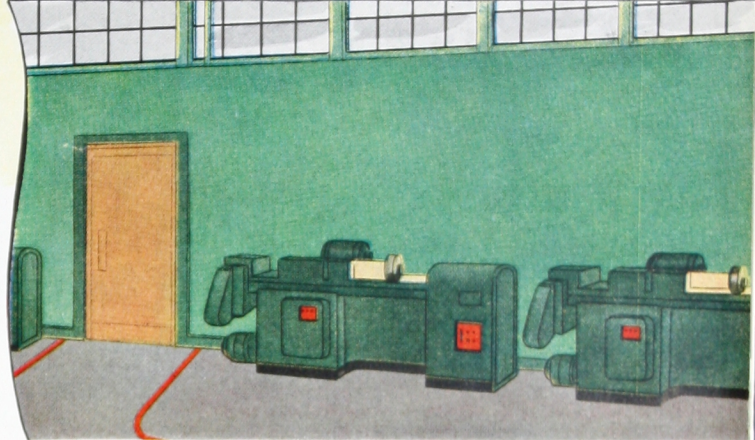
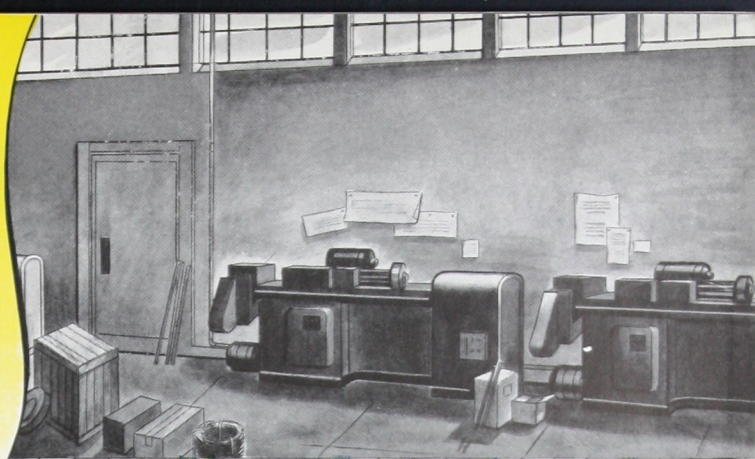
Furthermore, the human eye that has seen an excess of one color *compensates* by seeing the complimentary shade of that color when the glance shifts to any light-colored surface. For instance, a worker on a red plastic will *see green* for a few seconds when he looks up at a white wall. This produces a slight feeling of mental confusion which may gradually impair his efficiency. The logical way to eliminate this difficulty is to paint the wall the complimentary green of the red plastic. This is the most natural relief to the eye that has "seen red."

3—RECEDING SURFACES

It is advisable to make certain surfaces "recede" so that they do not call themselves to the attention of the worker. For example, a ceiling filled with beams, cross bracing, wires, and pipes gives an effect of visual clutter — seems to "bear down" on the worker. In cases where direct lighting is used and reflected light from the ceiling is of little or no value, a color like Cascade Blue gives an appearance of lightness and helps make the distracting ceiling seem to recede — thus giving the worker more apparent space and air to work in.

4—REFLECTING SURFACES

When indirect lighting is used, colors with very high reflectance qualities are indicated for the ceiling.



COLOR DYNAMICS

Applied to FLOORS, AISLES and

IN the small, old-fashioned factory, where material was distributed and work collected by hand trucks, the worker who stepped back too far into the aisle did not run into danger.

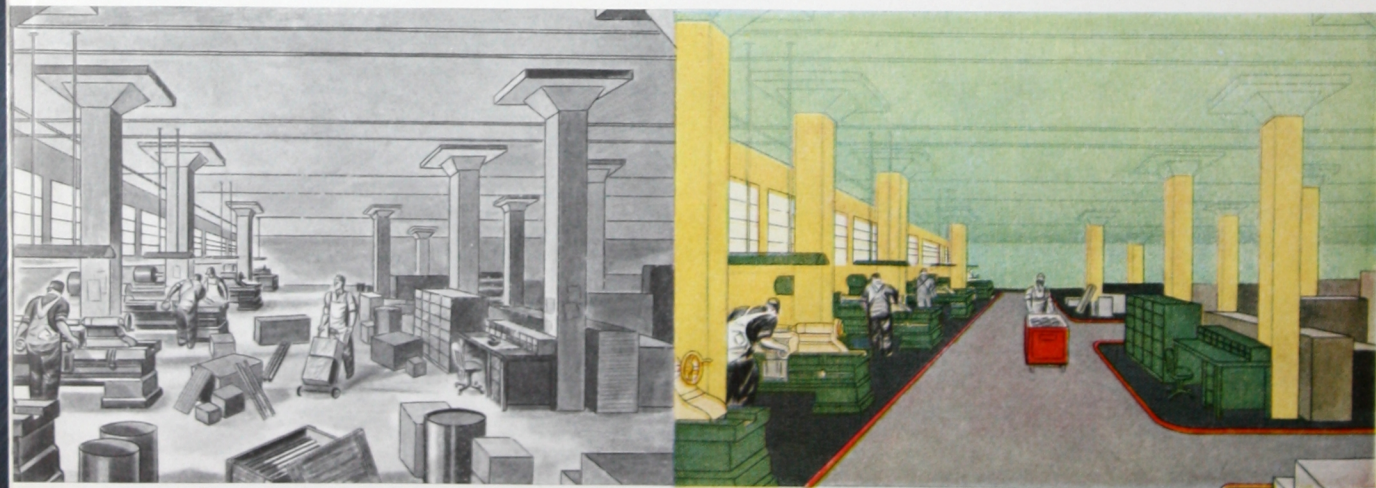
But in the modern plant, frequently covering many acres of floor space, with motorized trucks which are speeded up these days, traffic lanes are a real menace to careless employees. They present the same problems as city streets.

Not only must workers be protected against their own thoughtlessness but also truck operators should not be continually worried over the possibility of collisions. Otherwise they are likely to reduce the speed of their trucks — with a consequent lowering of efficiency.

COLOR SIGNALS

We recommend that all aisles and traffic lanes be clearly marked. This is done by painting the entire width of the aisle in a contrasting color to the body of the floor or by laying down thick stripes of a vivid color to serve as boundary lines. This will act as a warning to the worker that he is "in the street" and should be on the alert to avoid a "traffic accident."

At the same time, the automotive equipment should be painted in "Danger Signal" colors with high visibility — to warn workers of their approach. Colors of this same type should be used on cranes and overhead conveyors which dip down to chest height or lower at certain stations. Movable bins used to collect or distribute



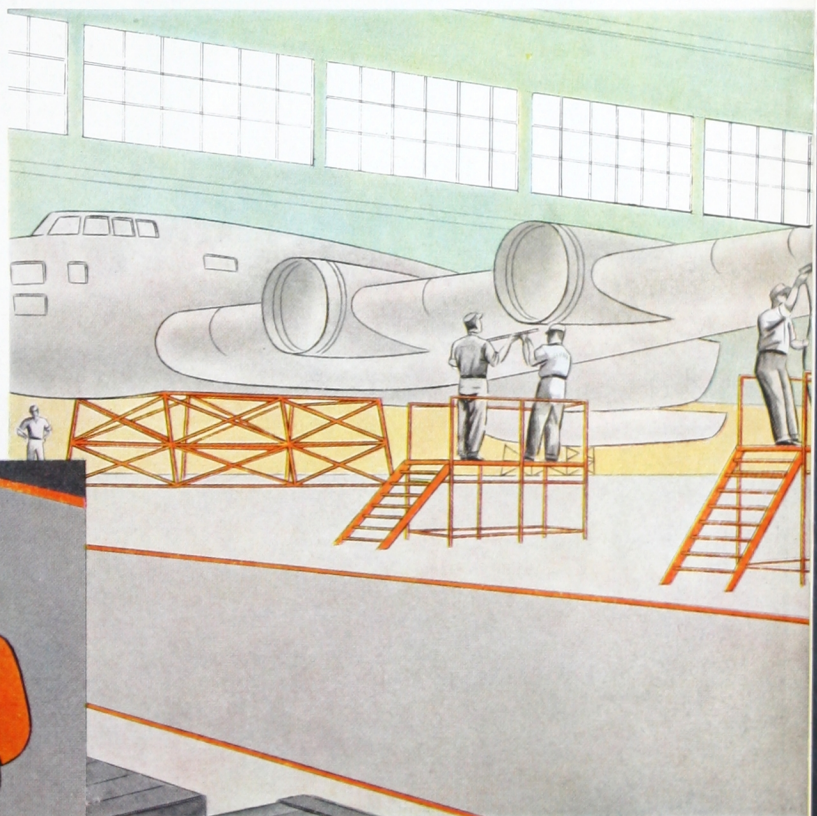
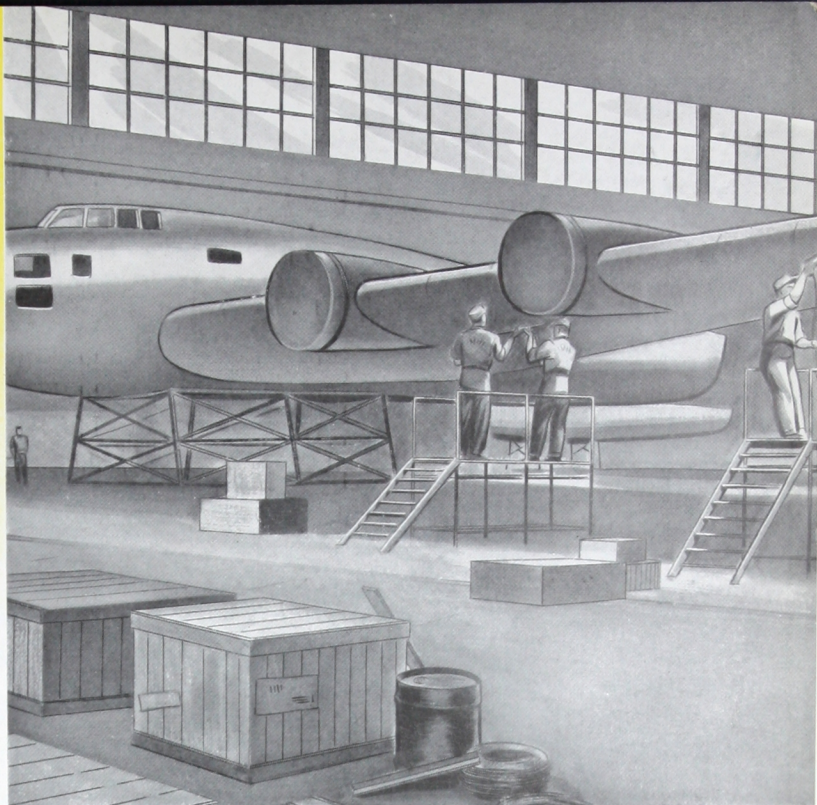
MOBILE EQUIPMENT

material should also be treated with colors that shout for attention. The inside of the bin should be given a color which makes it easy to see just how much material has been put in the bin.

REFLECTIVE FLOORS

Under certain circumstances, the under portions of products being fabricated, require more illumination. An example is an airplane wing where good visibility is essential below as well as above. Similar conditions generally prevail in the fabrication of all large objects, which cannot be readily turned for better observation.

The remedy here is to increase the reflectivity of the floors, thus gaining the benefits of proper light diffusion to the under side of the product being worked upon.



Let a PITTSBURGH

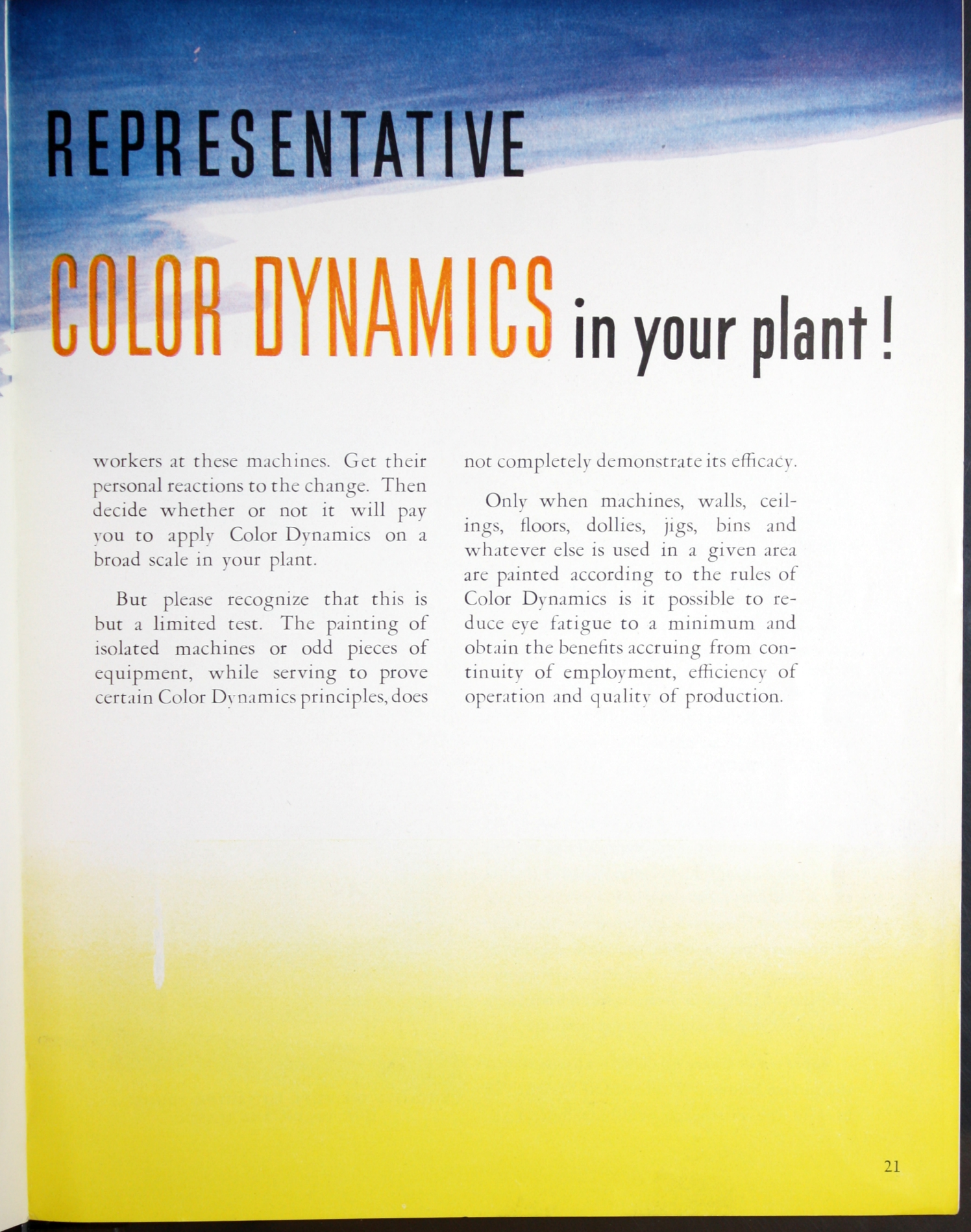
help you apply



Color Dynamics is a science—not a rule-of-thumb method. Pittsburgh representatives have the special training which qualifies them to apply the principles of Color Dynamics to every type of factory. If you would like one of them to make specific recommendations for any part of your plant, simply fill in the post card. A consultation costs you nothing and does not obligate you in any degree.

Applying Color Dynamics to your plant does not mean throwing out your present lighting system—or making expensive changes in it. The Pittsburgh representative will show you how to use color to *bring out the best* in the lights now installed in your factory.

One easy way to test the validity of Color Dynamics is to repaint one or two machines in accordance with the principle of *double contrast* outlined on pages 12 and 13. Check the “before and after” output of the



REPRESENTATIVE

COLOR DYNAMICS in your plant !

workers at these machines. Get their personal reactions to the change. Then decide whether or not it will pay you to apply Color Dynamics on a broad scale in your plant.

But please recognize that this is but a limited test. The painting of isolated machines or odd pieces of equipment, while serving to prove certain Color Dynamics principles, does

not completely demonstrate its efficacy.

Only when machines, walls, ceilings, floors, dollies, jigs, bins and whatever else is used in a given area are painted according to the rules of Color Dynamics is it possible to reduce eye fatigue to a minimum and obtain the benefits accruing from continuity of employment, efficiency of operation and quality of production.

COLOR DYNAMICS

plus

Live

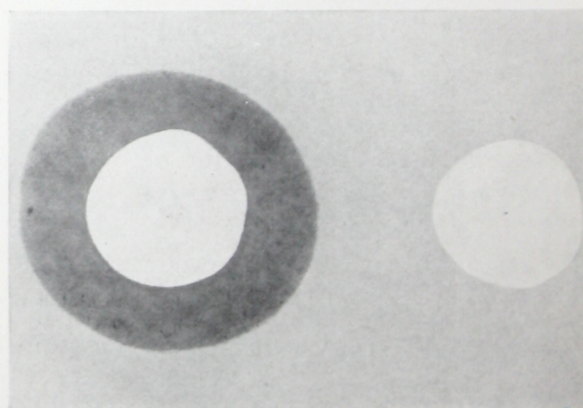
VITOLIZED OIL

The same forward-looking spirit which caused Pittsburgh to work out the new science of Color Dynamics is also responsible for improving the protective qualities of Pittsburgh Paints. Pittsburgh scientists have developed "Vitolized Oils" — one of the most important advances in paint-making of our time.

When enriched with "Vitolized Oil," paint gains in ruggedness and durability. Test No. 1 at right shows how the "Vitolized Oil" in Pittsburgh Paint remains in the paint film instead of soaking away into the surface beneath. Because such a high percentage of its original oil content is retained, the paint film stays LIVE, tough and elastic. Thanks to this extra elasticity, Pittsburgh Paints are better able to resist the cracking and peeling that occur in ordinary paints when the surface expands or contracts or is subject to constant vibrations. The life of the job is prolonged and cost-per-year-of-service is reduced to a minimum.

Note how ordinary oil (left) is absorbed into the surface below. "Vitolized Oil" (right) as used in the Pittsburgh Wallhide System re-

mains in the paint film, keeping it tough and elastic — live . . . enabling it to expand and contract with the surface over which it is applied. Thus Pittsburgh Paints are better able to resist extremes of heat and cold without peeling or cracking.



Live Paint "Inside"

VITOLIZED OIL KEEPS PITTSBURGH PAINTS
LIVE, TOUGH AND ELASTIC



STRUCTURAL MAINTENANCE

The modern industrial plant, under today's strenuous operating conditions, is confronted with the increasingly important problem of satisfactory maintenance. If production is to meet demand, every part of a plant from front office to shipping department must be maintained in 100 percent performance condition at all times. And no type of maintenance is of greater importance than the painting of walls, floors, ceilings, machinery, and equipment essential to steady production.

Because satisfactory painting in industrial plants presents many complex problems, Pittsburgh Plate Glass Company developed and offers to industry the "Paint Engineering Service" described below.

WHAT IT IS

This service consists of a careful, detailed examination of your plant by paint specialists at which time the requirements and conditions of each paintable surface are studied. From the

collected data specific recommendations applicable to *your* plant will be prepared. These recommendations will cover specifications for preparation of surface, product selected to meet the requirements, color best adapted to the operations and conditions, painting procedure and finally suggestions for maintenance of the work after completion. This service is rendered without cost. The survey results are put into a "Blue Book Binder" and the plant superintendent is furnished with sufficient copies for the use of his maintenance crews.

In the maintenance field, there are endless problems involving structural preservation, sanitation, hygiene, and production efficiency which can most successfully be solved through the Technical Laboratories of the Pittsburgh Plate Glass Company.

The services of our paint specialists and our color consultants are available to any manufacturer, plant superintendent, engineer, or architect.

Paint * P I T T S B U R G H * *Glass*
P L A T E G L A S S C O M P A N Y

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